

Attorney Docket No. 5576-125

PATENT

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Inventor: Kubota et al.

Serial No.: 09/851,274

Filed: May 8, 2001

For: RESIST MATERIAL AND METHOD FOR PATTERN FORMATION

Confirmation No. 3436

Group Art Unit: 1752

Examiner: Sin J. Lee

January 15, 2004

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**APPELLANTS' SUPPLEMENTAL BRIEF ON APPEAL**  
**UNDER 37 C.F.R. § 1.193**

Sir:

This Supplemental Appeal Brief is filed in triplicate pursuant to 37 C.F.R. § 1.193 requiring that a Request for Reinstatement of an Appeal to the Board of Patent Appeals and Interferences to be accompanied by a supplemental appeal brief.

**REAL PARTY IN INTEREST**

The real party in interest is Shin-Etsu Chemical Co., Ltd. the assignee of the rights to this application by virtue of an assignment from the inventors recorded at the United States Patent and Trademark Office on May 8, 2001 on Reel 011792, Frame 0366.

**RELATED APPEALS AND INTERFERENCES**

Appellants are aware of no appeals or interferences that would be affected by the present appeal.

**STATUS OF CLAIMS**

Claims 1-4 and 9-20 are pending in the present application as of the filing date of this Supplemental Appeal Brief. Appellants appeal the final rejection of claims 1-4 and 9-20. As of the filing date of this Supplemental Appeal Brief, claims 1-4 and 9-20 remain rejected under 35 U.S.C. § 103(a). The attached Claims Appendix presents the claims at issue as finally rejected in the Final Office Action dated January 22, 2003, as entered for purposes of

Appeal in the Advisory Action dated April 16, 2003, and as rejected in the non-final Office Action dated October 15, 2003.

### **STATUS OF AMENDMENTS**

An Amendment After Final was filed on March 18, 2003. The Advisory Action dated April 16, 2003 states that the proposed amendment will be entered. Accordingly, all amendments made by Appellants during prosecution are believed to be entered.

### **SUMMARY OF THE INVENTION**

The present invention, as recited in claims 1-4 and 9-20, generally relates to a novel resist material and a method for pattern formation.

The present invention can provide a resist material and a pattern formation method in which the coating property is improved, the occurrences of microbubbles in the solution is suppressed, and further occurrences of a variety of defects causing the yield reduction in the device manufacturing step are low. *See* Specification, page 2, lines 17-23. Additionally, the resist material of the present invention is sensitive to high-energy radiation or beam, and excels in sensitivity, resolution, and reproductivity. *See* Specification, page 3, lines 13-15.

The resist material of the present invention can be, but is not limited to, utility for a fine pattern formation material for manufacturing a super LSI at the exposure wavelength of a KrF, an ArF excimer laser. *See* Specification, page 3, lines 17-21.

### **ISSUE**

Whether claims 1-4 and 9-20 are obvious under 35 U.S.C. § 103(a) in view of U.S. Patent No. 6,159,656 to Kawabe et al. (Kawabe) with U.S. Patent No. 6,174,661 to Chen et al. (Chen et al.) which is cited to further support the Examiner's position.

### **GROUPING OF CLAIMS**

For the purposes of this Appeal with respect to the outstanding obviousness rejection, claims 1-4 and 9-20 are to be considered standing or falling together, and accordingly, are grouped together in Group I.

## ARGUMENT

### **I. Legal Standard of Obviousness**

Appellants note that a determination under 35 U.S.C. §103 that an invention would have been obvious to someone of ordinary skill in the art is a conclusion of law based on fact. *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1593, 1 U.S.P.Q.2d 1593 (Fed. Cir. 1987), *cert. denied*, 107 S.Ct. 2187. The Patent Office has the initial burden under §103 to establish a *prima facie* case of obviousness. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988).

In order to establish a *prima facie* case of obviousness, three basic criteria must be met. First, the prior art reference or combination of references must teach or suggest all the claim recitations of the present invention. *See In re Wilson*, 165 U.S.P.Q. 494 (C.C.P.A. 1970). Second, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings in order to arrive at the claimed invention. *See In re Oetiker*, 24 U.S.P.Q.2d 1443, 1446 (Fed. Cir. 1992); *In re Fine*, 837 F.2d at 1074; *In re Skinner*, 2 U.S.P.Q.2d 1788, 1790 (Bd. Pat. App. & Int. 1986). Third, there must be a reasonable expectation of success. *See* M.P.E.P. § 2143.

In the present case, the Examiner has not established a *prima facie* case of obviousness because the cited references fail to disclose all the claim recitations of the present invention, fail to suggest the modification of the references to arrive at the claimed invention, and lastly, fail to provide a reasonable expectation of success.

### **II. The Rejection**

In the Final Office Action dated January 22, 2003 (the Final Action), claims 1-4 and 9-20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,159,656 to Kawabe et al. (Kawabe et al.) with U.S. Patent No. 6,174,661 B1 to Chen et al. (Chen et al.), wherein Chen et al. is cited to support the Examiner's position that "Florad FC430" and "FC431" are fluorinated alkyl esters. The Examiner maintained this rejection in the Advisory Action dated April 16, 2003 (the Advisory Action). These rejections are further maintained in the non-final Office Action dated October 15, 2003 (non-final Office Action).

Appellants respectfully submit that claims 1-4 and 9-20 are not obvious under 35 U.S.C. § 103(a) in view of Kawabe et al. and respectfully request reversal of the rejection of claims 1-4 and 9-20 for reasons provided below.

**III. Claims 1-4 and 9-20 Are Not Obvious Under 35 U.S.C. § 103(a) In View of Kawabe et al.**

**A. Claims 1-4, 9-10, and 17-19 Are Not Obvious in View of Kawabe et al. in Combination with Chen et al.**

In the Advisory Action, the Examiner maintains the rejections of claims 1-4, 9-10, and 17-19 as set forth in the Final Action. More specifically, the Examiner states the following:

Kawabe clearly teaches that a nonionic surfactant can be further added to the taught photosensitive resin composition which comprises (A) a compound which generates an acid upon irradiation; (B) a polymer represented by formula (Ia-Id); (C) a nitrogen containing basic compound; and (D) at least one of a fluorine type surfactant and a silicone type surfactant (abstract). Thereby meeting the claim limitations of a combination of fluorine containing surfactant and a non-ionic surfactant. Kawabe teaches that the nonionic surfactant is added for the purpose of improving the applicability or developability of the taught resin composition (c. 44, l. 64-67). Therefore, one of ordinary skill in the art would have been motivated to optimize the amount of nonionic surfactant in order to obtain optimal results.

Advisory Action, page 2.

Appellants respectfully submit that the positive photosensitive resin of Kawabe et al. has been mischaracterized by the Examiner in the Final Action as well as the Advisory Action. In contrast to the present invention, Kawabe et al. is unclear with respect to the specific combination that results in the resin composition upon addition of the non-ionic surfactant. More specifically, Kawabe et al. does not disclose a resist material comprising one or more surfactants **having a fluorine substituent and between 10 and 2000 ppm of a non-ionic surfactant comprising one or more non-ionic surfactants having neither a fluorine substituent nor a silicon-containing substituent** as recited in claim 1. Kawabe et al. does not disclose a resist material comprising at least one resin, at least one solvent, at least one surfactant **having a fluorine substituent, and at least one non-ionic surfactant having neither a fluorine substituent nor a silicon-containing substituent, wherein the at**

**least one non-ionic surfactant is present in the resist material in an amount between 10 ppm and 2000 ppm** as recited in claim 17.

However, the non-final Office Action states that "[n]one of the examples which Kawabe lists in col. 45, lines 1-7 for his non-ionic surfactant includes any fluorine substituent or a silicon-containing substituent. Therefore, Kawabe *teaches* present non-ionic surfactant having neither a fluorine substituent nor a silicon-containing substituent." Non-final Office Action, pages 2-3 (emphasis added). Kawabe et al. is *silent* with respect to the composition of the non-ionic surfactant **having neither a fluorine substituent nor a silicon-containing substituent**, as disclosed in the present invention, which can be used to improve poor coating properties, to suppress the occurrences of microbubbles in solution, and to lower the occurrences of a variety of defects causing the yield reduction in the device manufacturing step. Such properties are explained in detail in the present application at page 2, line 18 through page 3, line 21. In view of the standards set forth under 35 U.S.C. § 103, as set forth above, Applicants respectfully submit that merely failing to discuss or even acknowledge a non-ionic surfactant having neither a fluorine substituent nor a silicon-containing substituent clearly **does not** constitute a "teaching" or even a "suggestion" of a non-ionic surfactant having neither a fluorine substituent nor a silicon-containing substituent. Therefore, Kawabe et al. fails to teach or suggest the specific combination contributing to the resist material composition as recited in claims 1 or 17. Thus, the resist materials of the present invention as recited in the claims are distinct from the positive photosensitive resin composition of Kawabe et al.

Appellants further submit that Kawabe et al. fails to recognize the result-effective capability of the non-ionic surfactant. At column 44, lines 64-67, Kawabe et al. merely mentions that "[a] nonionic surfactant can be further added for the purpose of improving the applicability of each photosensitive resin composition of the present invention or improving developability." The mere mention of the addition of a non-ionic surfactant for improving "applicability" or "developability" is not a substitute for the teachings of the present application providing **specific combinations** of **specific chemical compounds** with distinct chemical characteristics to provide distinct resist materials coupled with an appreciation of the effects of the present invention as discussed above. Thus, in contrast to the assertions of the Examiner, Appellants respectfully submit that one of ordinary skill in the art would not have been motivated to modify the proposals of Kawabe et al. to arrive at the present

invention. One of ordinary skill in the art would have been even less apt to have optimized the amount of the non-ionic surfactant of Kawabe et al. and certainly not, a non-ionic surfactant having neither a fluorine substituent nor a silicon-containing substituent in order to arrive at the present invention where Kawabe et al. fails to teach or suggest addition of a non-ionic surfactant having neither a fluorine substituent nor a silicon-containing substituent. Consequently, in contrast to the assertions of the Final Action, far more than routine skill is required to arrive at the present invention on the basis of Kawabe et al. where specific result-effective variables, for example, a non-ionic surfactant having neither a fluorine substituent nor a silicon-containing substituent, is provided only through the disclosure of the present application. Appellants further note that Chen et al. does not cure the deficiencies of Kawabe et al. Chen et al. merely proposes a photographic element comprising, among other things, a lubricant layer containing a fluoro compound.

**B. Claims 13-16 Are Not Obvious in View of Kawabe et al. in Combination with Chen et al.**

In the Advisory Action, the Examiner further maintains the rejections of claims 13-16 as set forth in the Final Action. More specifically, the Examiner states the following:

Kawabe clearly teaches that the taught resin composition is exposed to an exposure light having a wavelength of 220 nm or shorter through a given mask (c. 45, l. 51-58). The taught examples exemplify the resist film being exposed to ArF excimer laser (193 nm) light through a mask (c. 50, l. 33-39). It is the examiner's position that an exposure light having a wavelength of 220 nm or less such as ArF excimer laser meets the limitation of a high energy radiation having a wavelength of less than 500 nm.

Advisory Action, page 2.

For the reasons set forth above, Appellants respectfully submit that the resist material of the present invention is not the same as, or comparable to, the resin composition proposed by Kawabe et al. As such, claim 13 directed to a method for forming a pattern on a substrate comprising, among other things, coating a resist material on a substrate, the resist material comprising one or more surfactants having a fluorine substituent and between 10 and 2000 ppm of a non-ionic surfactant comprising one or more non-ionic surfactants having neither a fluorine substituent nor a silicon-containing substituent is not obvious in view of Kawabe et al. As previously noted, Chen et al. does not cure the deficiencies of Kawabe et al.

**C. Claims 11, 12, and 20 Are Not Obvious in View of Kawabe et al. in Combination with Chen et al.**

In the Advisory Action, the Examiner maintains the rejections of claims 11, 12, and 20 as set forth in the Final Action. More specifically, the Examiner states the following:

Kawabe teaches that the nonionic surfactant is added for the purpose of improving the applicability or developability of the taught resin composition (c. 44, l. 64-67). Therefore, one of ordinary skill in the art would have been motivated to optimize the amount of nonionic surfactant in order to obtain optimal results.

Advisory Action, page 2.

Appellants again note the mischaracterization of the positive photosensitive resin of Kawabe et al. In contrast to the assertions set forth by the Examiner, Kawabe et al. does not disclose a resist material comprising one or more surfactants having a fluorine substituent and between 10 and 2000 ppm of a non-ionic surfactant comprising one or more non-ionic surfactants having neither a fluorine substituent nor a silicon-containing substituent. Kawabe et al. merely mentions that a non-ionic surfactant can be added for the purpose of improving applicability or developability. Neither the composition of the non-ionic surfactant nor the amount of the non-ionic surfactant of the present invention are taught or suggested by Kawabe et al. Thus, one of ordinary skill in the art would not have been motivated to optimize the composition of the non-ionic surfactant or the amount of the non-ionic surfactant of Kawabe et al. in order to obtain the resist material of the present invention.

**D. Examples 1-6 and Comparative Examples 1-6 of the Present Application Further Illustrate the Nonobviousness of the Present Invention**

As noted above under Section II, Chen et al. is cited to support the Examiner's position that "Florad FC430" and "FC431" are fluorinated alkyl esters. In the non-final Office Action on pages 4-5, the Examiner states that "it is the Examiner's position that it would have been obvious to one of ordinary skill in the art to use Florad FC430 or FC431 in place of the Megafac F176 in Kawabe's Examples 1 and 2 with a reasonable expectation of achieving a positive photosensitive resin composition which shows excellent performances with respect to the residual film ratio, resist profile, resolution, and dry-etching resistance." Appellants respectfully disagree with the Examiner's conclusion.

Appellants respectfully submit that a review of the comparative examples reveals that merely substituting Florad FC430 in place of the Megafac F176 in Kawabe's examples does not provide a reasonable expectation of achieving the resist materials provided by the present invention. More specifically, FC430 was employed in Comparative Example 6 and demonstrates, among other things, that a surfactant having a fluorine substituent without an addition of the non-ionic surfactant results in a large number of contaminants on the pattern surface and a large number of liquid particles. See Table 1, page 23 of the present application. Thus, it is only through the teachings of the present application that one of ordinary skill in the art is able to arrive at the present invention.

**E. Motivation to Modify Kawabe et al. Cannot be Derived From Applicants' Specification**

Appellants respectfully submit that any motivation to modify Kawabe et al. is derived from the disclosure in Appellants' specification. Appellants respectfully note that the Federal Circuit has repeatedly warned that the requisite motivation must come from the cited reference and not Applicant's specification. See *In re Dow Chem. Co.*, 837 F.2d 469, 473 (Fed. Cir. 1988); see also *Grain Processing Corp. v. American Maize-Prods. Co.*, 840 F.2d 902, 907 (Fed. Cir. 1988).

In the instant case, as noted above, Kawabe et al. merely proposes that a non-ionic surfactant be further added to the photosensitive resin composition. Thus, Kawabe et al. fails to teach or suggest the specific combination contributing to the resist material composition as recited in the claims of the present application. Additionally, Kawabe et al. fails to discuss a non-ionic surfactant having neither a fluorine substituent nor a silicon-containing substituent. Thus, Kawabe et al. is unclear with respect to the specific combination that results in the resin composition upon addition of the non-ionic surfactant. Kawabe et al. also fails to recognize specific result-effective variables, such as a non-ionic surfactant having neither a fluorine substituent nor a silicon-containing substituent, that are provided only through the disclosure of the present application. Thus, neither the composition of the non-ionic surfactant nor the amount of the non-ionic surfactant of the present invention are taught or suggested by Kawabe et al. Furthermore, Chen et al. does not cure the deficiencies of Kawabe et al.



Appellants respectfully submit that it is only in view of the present application disclosing specific combinations of specific chemical compounds and the methods disclosed therein, that one of ordinary skill in the art is able to arrive at the present invention. Consequently, it is only through impermissible hindsight that modification of Kawabe et al. would enable one of ordinary skill in the art to arrive at the resist material and methods of the present invention.

In sum, the resist materials and methods of forming the resist materials disclosed by the present invention are distinct from the positive photosensitive resin and method of forming the positive photosensitive resin suggested by Kawabe et al. Claim 1 relates to resist materials comprising one or more surfactants having a fluorine substituent and between 10 and 2000 ppm of a non-ionic surfactant comprising one or more non-ionic surfactants having neither a fluorine substituent nor a silicon-containing substituent. Claim 13 relates to methods of forming a pattern on a substrate comprising, among other things, coating a resist material of the present invention on a substrate. Claim 17 relates to resist materials comprising at least one resin, at least one solvent, at least one surfactant having a fluorine substituent, and at least one non-ionic surfactant having neither a fluorine substituent nor a silicon-containing substituent, wherein the at least one non-ionic surfactant is present in the resist material in an amount between 10 ppm and 2000 ppm. Thus, the recitations of the independent claims, and claims dependent therefrom, are patentably distinct from the proposals of Kawabe et al. wherein the deficiencies of Kawabe et al. are not cured by Chen et al. which also fails to address specific combinations of the specific chemical compounds as recited in the claims of the present application.

Accordingly, Appellants respectfully submit that claims 1-4 and 9-20 are not obvious in view of Kawabe et al. in combination with Chen et al.

### CONCLUSION

In light of the entire record and the above discussion, Appellants respectfully submit that claims 1-4 and 9-20 are patentable over the cited references. Accordingly, Appellants

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respectfully request reversal of the pending rejection of claims 1-4 and 9-20, and that this case be passed to issuance.

Respectfully submitted,



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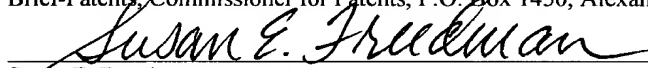
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Date of Signature: January 15, 2004

## **CLAIMS APPENDIX**

### **What is Claimed is:**

1. (Previously Presented) A resist material comprising one or more surfactants having a fluorine substituent and between 10 and 2000 ppm of a non-ionic surfactant comprising one or more non-ionic surfactants having neither a fluorine substituent nor a silicon-containing substituent.
2. (Previously Presented) A resist material according to claim 1 wherein said non-ionic surfactant is one or more compounds selected from the group consisting of polyoxyalkylene alkyl ether esters, polyoxyalkylene alkyl ether, polyoxyalkylene dialkyl ether, polyoxyalkylene aralkyl alkyl ether, polyoxyalkylene aralkyl ether, polyoxyalkylene diaralkyl ether, and polyoxyalkylene laurylates.
3. (Original) A resist material according to claim 1 being a chemically amplified resist material and subject to exposure to high energy radiation of 500 nm or less, X ray or electron beam.
4. (Original) A resist material according to claim 2 being a chemically amplified resist material and subject to exposure to high energy radiation of 500 nm or less, X ray or electron beam.
- 5-8. (Canceled)
9. (Previously Presented) A resist material according to claim 1 wherein said one or more surfactants having a fluorine substituent is selected from the group consisting of perfluoroalkylpolyoxyethylene ethanol, fluorinated alkyl ester, perfluoroalkylamine oxide, perfluoroalkylethylene oxide adduct, and fluorine-containing organosiloxane compounds.

10. (Original) A resist material according to claim 1 wherein said one or more surfactants having a fluorine substituent is present in an amount ranging from 10 to 2,000 ppm.

11. (Original) A resist material according to claim 1 wherein the weight ratio of the non-ionic surfactant having neither a fluorine substituent nor a silicon containing substituent to the surfactant containing a fluorine substituent is 0.1 or greater.

12. (Original) A resist material according to claim 11 wherein the weight ratio of the non-ionic surfactant having neither a fluorine substituent nor a silicon containing substituent to the surfactant containing a fluorine substituent ranges from 0.1 to 100.

13. (Previously Presented) A method for forming a pattern on a substrate comprising:

coating a resist material on a substrate, the resist material comprising one or more surfactants having a fluorine substituent and between 10 and 2000 ppm of a non-ionic surfactant comprising one or more non-ionic surfactants having neither a fluorine substituent nor a silicon-containing substituent;

subjecting the substrate to heat to treat the substrate;

exposing the substrate through a photomask to radiation selected from the group consisting of high energy radiation having a wavelength of 500 nm or less, X-ray radiation, and electron beam radiation;

optionally heat treating the substrate; and

developing the substrate in a developing solution.

14. (Original) A method according to claim 13 wherein said non-ionic surfactant is one or more compounds selected from the group consisting of polyoxyalkylene alkyl ether esters, polyoxyalkylene alkyl ether, polyoxyalkylene dialkyl ether, polyoxyalkylene aralkyl alkyl ether, polyoxyalkylene aralkyl ether, polyoxyalkylene diaralkyl ether, and polyoxyalkylene laurylates.

15. (Original) A method according to claim 13 wherein the resist material is a chemically amplified resist material.

16. (Original) A method according to Claim 14 wherein the resist material is a chemically amplified resist material.

17. (Original) A resist material comprising:  
at least one resin;  
at least one solvent;  
at least one surfactant having a fluorine substituent; and  
at least one non-ionic surfactant having neither a fluorine substituent nor a silicon-containing substituent, wherein the at least one non-ionic surfactant is present in the resist material in an amount between 10 ppm and 2000 ppm.

18. (Original) A resist material according to claim 17, wherein said non-ionic surfactant is one or more compounds selected from the group consisting of polyoxyalkylene alkyl ether esters, polyoxyalkylene alkyl ether, polyoxyalkylene dialkyl ether, polyoxyalkylene aralkyl alkyl ether, polyoxyalkylene aralkyl ether, polyoxyalkylene diaralkyl ether, and polyoxyalkylene laurylates.

19. (Original) A resist material according to claim 17, wherein said at least one surfactant having a fluorine substituent is selected from the group consisting of perfluoroalkylpolyoxyethylene ethanol, fluorinated alkyl ester, perfluoroalkylamine oxide, perfluoroalkylethylene oxide adduct, and fluorine-containing organosiloxane compounds.

20. (Original) A resist material according to claim 17, wherein a weight ratio of the at least one non-ionic surfactant having neither a fluorine substituent nor a silicon-containing substituent to the surfactant containing a fluorine substituent ranges from 0.1 to 100.

## **TABLE OF AUTHORITIES**

### **CASES**

In re Fine, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). -----	3
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### **STATUTES**

35 U.S.C. § 103(a) (1994). -----	1, 2, 3, 4
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### **OTHER AUTHORITIES**

MANUAL OF PATENT EXAMINING PROCEDURE § 2143 (8th ed., rev. 1, 2001). -----	3
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